

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method for decoding a linear code on ring R , the method ~~being characterized by including~~ comprising:

~~a low density processing step for reducing [[the]] a density of a check matrix of the linear code by reducing a density of elements included in the check matrix and having values that whose values are determined to be one "1", for a check matrix of the linear code; and~~

~~a decoding step for decoding the linear code through a sum product algorithm by using the check matrix whose density [[is]] has been reduced through the low density processing step.~~

2. (Currently Amended) The decoding method according to claim 1, ~~characterized in that wherein~~ the ~~[[ring]]~~ linear code is a finite field including powers of prime numbers, as elements.

3. (Currently Amended) The decoding method according to claim 2, ~~characterized in that wherein~~ the linear code includes a BCH code, or a Reed-Solomon code on the finite field.

4. (Currently Amended) The decoding method according to claim 1, ~~characterized in that wherein~~ reducing the density ~~low density processing step~~ includes:

~~a linear combination calculation step for calculating a~~ linear combination of rows of the check matrix;

~~and a check matrix generation step for extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination calculated through the linear combination calculation step;~~ and

generating a new check matrix by including all the vectors of the vector subset~~[[,]]~~ as row elements of the new check matrix.

5. (Currently Amended) The decoding method according to claim 4, ~~characterized in that~~ wherein reducing the low density processing step density further includes:

~~an expansion step for expanding the check matrix by expanding [[on]] the finite field on a predetermined subfield of the finite field [[in]] by a predetermined degree,~~ ~~wherein the linear combination calculation step is provided for;~~ and

calculating linear combination of the rows of the expanded check matrix ~~expanded through the expansion step.~~

6. (Currently Amended) A decoder for decoding a linear code₁ ~~on ring R, the decoder being characterized by including~~ the decoder comprising:

~~low density processing means that performs low density processing for reducing~~ ~~[[the]]~~ a density of a check matrix of the linear code by reducing a density of elements included in the check matrix and having values that ~~whose values are determined to be one "1", for a check matrix of the linear code;~~ and

~~decoding~~ means for decoding the linear code through a sum product algorithm by using the check matrix whose density ~~[[is]]~~ has been reduced ~~by the low density processing means.~~

7. (Currently Amended) The decoder according to claim 6, ~~characterized in that~~ wherein the ~~[[ring]]~~ linear code is a finite field including powers of prime numbers, as elements.

8. (Currently Amended) The decoder according to claim 7, ~~characterized in that~~ wherein the linear code includes a BCH code, or a Reed-Solomon code on the finite field.

9. (Currently Amended) The decoder according to claim 6, ~~characterized in that~~ wherein the ~~low density processing means~~ for reducing includes:

~~linear combination calculation~~ means for calculating a linear combination of rows of the check matrix;

~~and check matrix generation~~ means for extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination ~~calculated by the linear combination calculation means;~~ and

means for generating a new check matrix by including all the vectors of the vector subset~~[[,]]~~ as row elements of the new check matrix.

10. (Currently Amended) The decoder according to claim 9, ~~characterized in that the~~

~~low-density processing~~ further comprising ~~means further includes expansion means~~ for expanding the check matrix ~~on the finite field on~~ by expanding a predetermined subfield of the finite field ~~[[in]]~~ by a predetermined degree, wherein the ~~linear combination calculation~~ means for calculating calculates linear combination of rows of the expanded check matrix ~~expanded through the expansion means~~.

11. (Currently Amended) The decoder according to claim 6, ~~characterized by further~~ including ~~soft decision decoding~~ means for performing soft-decision decoding ~~[[for]]~~ on a linear code subjected to convolutional encoding, wherein the ~~low-density processing~~ means for reducing reduces the density of a check matrix obtained by decoding the convolutianly encoded linear code, the reduction being performed by reducing a density of [[the]] elements included in the obtained check matrix and having whose values that are determined to be one "1", ~~for the check matrix of the linear code subjected to the soft decision decoding by the soft decision decoding means~~.

12. (Currently Amended) The decoder according to claim 11, ~~characterized in that~~ wherein the soft-decision decoding ~~by the soft decision decoding means~~, the low-density processing ~~by the low-density processing means~~, and the decoding ~~by the decoding means~~ are repetitively performed.

13. (Canceled)

14. (Currently Amended) A method for decoding a linear code on ring R , the decoding method being characterized by including comprising:

~~an input step for~~ inputting a reception value; and

~~a decoding step for~~ decoding the linear code through a sum product algorithm,

[[for]] by using a check matrix of the linear code and the reception value, by using check matrix, where the check matrix including elements having reduced density, wherein the density is reduced when it is of elements whose values are determined that the value of one of the elements is to be one "1" is reduced, and the reception value input through the input step.

15. (Currently Amended) A decoder for decoding a linear code on ring R , the decoder being characterized by including comprising:

~~input means for~~ inputting a reception value; and

~~decoding means for~~ decoding the linear code through a sum product algorithm,

[[for]] by using a check matrix of the linear code and the reception value, by using check matrix, where the check matrix including elements having reduced density, wherein the density is reduced when it is of elements whose values are determined that the value of one of the elements is to be one "1" is reduced, and the reception value input by the input means.

16. (Currently Amended) A computer-readable storage medium storing a program for making causing a computer to execute a method of decoding ~~decode~~ a linear code, on-

ring R, characterized in that the computer is made to perform processing including
method comprising:

~~an input step for~~ inputting a reception value; and

~~a decoding step for~~ decoding the linear code through a sum product algorithm,
[[for]] by using a check matrix of the linear code and the reception value, ~~by using check~~
~~matrix, where the check matrix including elements having reduced density, wherein the~~
density is reduced when it is of elements whose values are determined that the value of
one of the elements is to be one "1" ~~is reduced, and the reception value input through~~
~~the input step.~~

17-32. (Canceled)